

New statement of the European Society of Cardiology on diagnosing diastolic heart failure: what are the key messages

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Introduction

In October 2007, Heart Failure and Echocardiography Associations of the European Society of Cardiology jointly published an updated set of criteria to diagnose diastolic heart failure [1]. A reappraisal of the previous criteria was necessary [2], as new cardiac imaging techniques like tissue Doppler, and novel heart failure biomarkers like brain natriuretic peptide (NT pro-BNP) have become commonly used diagnostic techniques.

In the past decades, the prevalence of diastolic heart failure has increased, currently accounting for more than 50% of all heart failure patients in western societies [3]. Predisposing factors for diastolic heart failure are older age, female gender, diabetes, obesity, arterial hypertension and left ventricular (LV) hypertrophy. The prognosis of patients suffering from diastolic heart failure is at least as ominous as the prognosis of patients suffering from systolic heart failure [4]. While the significance of diastolic heart failure is clearly recognized, the debate continues whether diastolic heart failure is a distinct clinical entity differing from systolic heart failure, or that the two are just successive phenotypes of the same heart failure syndrome. The latter is implied by the use of the terms "heart failure with a normal ejection fraction" (HFNEF) or "heart failure with a reduced ejection fraction" (HFREF) to indicate respectively diastolic and systolic heart failure. For clarity, the terms HFNEF and HFREF will be used throughout this editorial. This use of HFNEF and HFREF does not imply that the issue of heart failure presenting as one or two syndromes is resolved.

This summary discusses the newly proposed diagnostic strategy on "how to diagnose HFNEF" or on "how to exclude HFNEF".

How to diagnose HFNEF?

Three obligatory conditions need to be satisfied for the diagnosis of HFNEF:

- 1) presence of signs or symptoms of congestive heart failure
- 2) presence of normal or mildly abnormal LV systolic function
- 3) evidence of diastolic LV dysfunction.

Signs or symptoms of congestive heart failure. Since many patients with HFNEF present with breathlessness and no signs of fluid overload, symptoms are considered sufficient clinical evidence to suggest the presence of congestive heart failure. Objective evidence of reduced exercise performance can be provided by metabolic exercise testing with measurements of peak exercise oxygen consumption ($\text{VO}_{2\text{max}} < 14 \text{ ml/kg/min}$), or by the 6 minute walking test (marked limitation $< 300 \text{ m}$).

Normal or mildly abnormal LV systolic function. A LV ejection fraction (LVEF) of 50% is proposed as cut-off value of mildly abnormal LV systolic function and a LV end-diastolic volume index (LVEDVI) of 97 ml/m^2 as cut-off value of the absence of significant LV enlargement. Left ventricular ejection fraction and LVEDVI should be measured in accordance to the recent recommendations of the American Society of Echocardiography and the European Association of Echocardiography [5].

Evidence of diastolic LV dysfunction. Invasive diagnostic evidence of diastolic LV dysfunction can be obtained by measuring mean pulmonary capillary wedge pressure (mPCW $> 12 \text{ mmHg}$), LV end-diastolic pressure (LVEDP $> 16 \text{ mmHg}$), the time constant of LV relaxation ($\tau > 48 \text{ ms}$), or the LV stiffness modulus ($b > 0.27$). Noninvasive diagnostic evidence of diastolic LV dysfunction is preferably derived from myocardial tissue Doppler (TD; $\text{E}/\text{E}' > 15$). If myocardial TD yields values suggestive but non-diagnostic for diastolic LV dysfunction ($15 > \text{E}/\text{E}' > 8$), TD needs to be implemented with other non-invasive investigations to provide diagnostic evidence of diastolic LV dysfunction. These non-invasive investigations can consist of:

- 1) a blood flow Doppler of mitral valve flow velocity (E/A ratio < 0.5 and deceleration time [DT] $> 280 \text{ ms}$ combined, for patients over 50 years old), or of pulmonary vein flow velocity (Ard-Ad index $> 30 \text{ ms}$)

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- 2) an echocardiographic measure of left atrial volume index (LAVI >40 ml/m²) or of LV mass index (LVMI: men >122 g/m², women >149 g/m²)
- 3) an electrocardiogram with evidence of atrial fibrillation
- 4) a determination of plasma BNP (>200 pg/ml) or NT-proBNP (>220 pg/ml).

If plasma NT-proBNP >220 pg/ml or BNP >200 pg/ml, diagnostic evidence of diastolic LV dysfunction also requires additional non-invasive investigations, which can consist of:

- 1) 'TD (E/E)' ratio)
- 2) a blood flow Doppler (E/A ratio and DT combined; Ard-Ad index)
- 3) echo measures of LV mass index or left atrial volume index
- 4) electrocardiographic evidence of atrial fibrillation.

The proposed use of different echocardiographic techniques allows for a comprehensive non-invasive assessment of LV relaxation, LV diastolic stiffness, and LV filling pressures [6].

How to exclude HFNEF?

Heart failure with a normal ejection fraction is frequently a challenging differential diagnosis in a work-up for breathlessness in the absence of signs of fluid overload. A strategy was therefore also proposed to exclude HFNEF. If a patient with breathlessness and no signs of fluid overload has a NT-proBNP <120 pg/ml or a BNP <100 pg/ml, any form of heart failure is virtually ruled out because of the high negative predictive value of plasma natriuretic peptides, and pulmonary disease becomes the most likely cause of breathlessness. If an echocardiogram confirms the absence of valvular or pericardial disease, LVEF and LV volumes should be measured. In a patient with LVEF $>50\%$, if LVEDVI is <76 ml/m², and if the patient has no atrial fibrillation, atrial dilatation (LAVI <29 ml/m²), LV hypertrophy (LVMI: men <96 g/m², women <116 g/m²), low TD shortening velocity ($S >6,5$ cm/s) or high TD E/E' (E/E' <8), the diagnosis of HFNEF is ruled out.

Conclusions

As HFNEF currently accounts for more than 50% of all heart failure patients and because of the introduction of new diagnostic tools, an updated set of diagnostic criteria for HFNEF is required. Novel diagnostic flowcharts on "how to diagnose HFNEF" and on "how to exclude HFNEF" have therefore recently been established [1]. The diagnostic flowchart on "how to diagnose HFNEF" is specifically intended for patients suspected of having HFNEF and is primarily based on the positive predictive value of successive examinations. The flow chart on "how to exclude HFNEF" is proposed for patients presenting with breathlessness and no physical signs of fluid overload and is mainly based on the negative predictive value of successive examinations. These updated strategies for the diagnosis of HFNEF should be helpful not only for individual patient management but also for patient selection of future clinical trials looking at specific treatment modalities for HFNEF.

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